ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
TANK PROGRAMS DIVISION
UNDERGROUND STORAGE TANKS

RBCA TIER 2 SOFTWARE
ART2 Version 1.0

USER MANUAL

14 April 2005
TM 05-04

HARDWARE AND SOFTWARE REQUIREMENTS

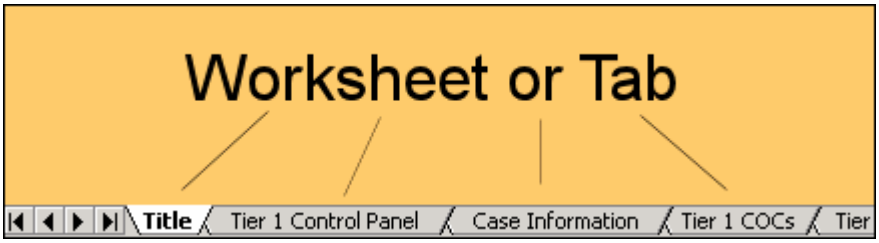
Minimum
300 mHz Pentium II
128 mbytes RAM
Microsoft Windows 98
Microsoft Excel Version 8 (part of Microsoft Office 97)

Recommended
1 gHz Pentium III
512 mbytes RAM
Microsoft Windows 2000
Microsoft Excel Version 9 (part of Microsoft Office 2000)

INTRODUCTION

Please read through this *entire* manual before installing and using ***ART2***, the Arizona Department of Environmental Quality (ADEQ) Underground Storage Tank (UST) Program Risk-Based Corrective Action (RBCA) Tier 2 Software. Also download and read the separate ADEQ document "How 2 Tier 2" for additional information on Arizona's Tier 2 process. ART2 was conceived by ADEQ to be a calculation tool compatible with the ADEQ Release Reporting and Corrective Action Guidance, found at `http://www.azdeq.gov/`.

The terms 'worksheet' and 'tab' are used interchangeably throughout this manual. Each refers to Excel worksheets, which are represented by tabs at the bottom of the Excel application (see below). **Do not** change the worksheet names because they are integral to the functioning of ART2.



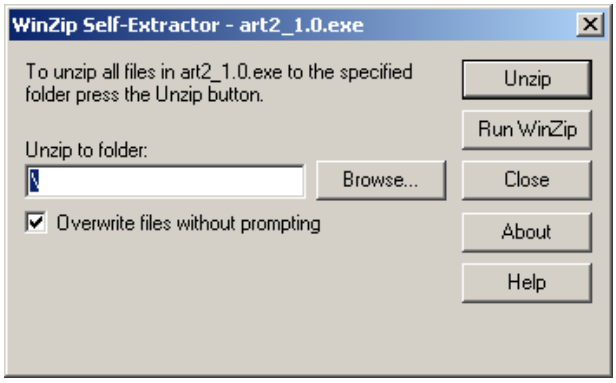
Known Issues

With certain version combinations of Windows and Excel, ART2 will crash when performing a "Save As" in Excel (*i.e.*, `File > Save As…`). To make a copy of the application, first perform a regular "Save" in Excel (*i.e.*, `File > Save`), then exit Excel and use Windows to make a copy of the application (see the section on "Using ART2 on Multiple Sites" near the end of this manual for an example of this process)

INSTALLATION

1. Download `ART2_1.0.exe` from the ADEQ web site, `http://www.azdeq.gov/`, to your computer. `ART2_1.0.exe` is a self-extracting archive (Zip file) of ART2 and its supporting files.

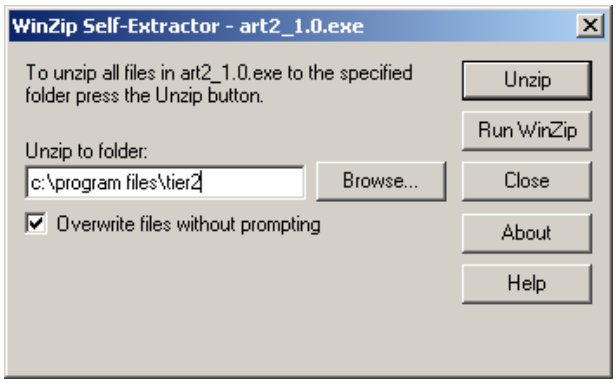
2. After downloading, run `ART2_1.0.exe` by double-clicking it. The WinZip Self-Extractor will open a window that looks like:



If you select the Unzip button at this point, ART2 will be installed in a folder named `art2` off the root directory of the drive where `ART2_1.0exe` is run (the root directory is represented by the "\"). For example, if you are running `ART2_1.0.exe` from your `c:` drive, the application will be installed in `c:\art2`. **This is the default and recommended configuration.**

Note that if you are reinstalling ART2 and have the "Overwrite files without prompting" checkbox checked (see above), your previous installation will be overwritten and any data or results you had stored in ART2 will be lost.

You can install ART2 in a different directory by changing the "Unzip to folder" information. For example, if you want to install ART2 in `c:\program files\tier2`, put that information in the "Unzip to folder" box (see below).



If you install ART2 in a directory other than the default, please make careful note of that directory: you'll be entering that information into ART2 when it is configured.

IMPORTANT: ART2 will be installed in a directory called `art2` that will be under the directory specified in the "Unzip to folder" (*e.g.*, `c:\program files\tier2\art2`).

3. Download and install ProUCL 3.00.02, which can be found by going to U.S. Environmental Protection Agency web site (`http://www.epa.gov/`) and searching on "ProUCL". Install anywhere on your PC (by default, ProUCL will be installed on `c:\ProUCL`), but make note of the drive and directory where it's installed. Note: ART2 Version 1.0 was written to work with ProUCL version 3.00.02.

SOFTWARE USE

Tier 1 (Ctrl + m)

1. Compile your site analytical data and have it ready for input.

2. Navigate to the folder where ART2 was installed (see Installation Step 2, above) and start ART2 by double-clicking on `ART2.xls`. Depending on how you have Excel configured, you may get a warning message indicating that ART2 has macros. Select the "Enable Macros" button to continue. Once ART2 has started, you'll see the title page and disclaimer. From this point, select "Continue" to move to the Tier 1 Control Panel.

3. Select Step 1 to enter Program and Case Information. Select the type of evaluation being performed, either Preliminary, Screening, or Final (these terms are defined in the How 2 Tier 2 document). Enter the ProUCL program directory (see Installation, Step 3, above) and the GPL (Groundwater Protection Level) directory. GPL is an ADEQ application (`GPL.exe`) located in the same directory as ART2 (see Installation Step 2, above). For example, if you used the default installation, then the GPL directory will be `c:\art2`.

   Additionally, enter the case information where indicated. **Note that if a LUST Number is not provided, the review and acceptance of your report may be delayed.**

   After entering this information, select "Click here to apply case information...". Processing case information may require several minutes to complete. You can return to this page and make changes at any time while using ART2. After the Program and Case Information are processed, ART2 will return you to the Tier 1 Control Panel.

4. On the Tier 1 Control Panel, select Step 2 to enter site analytical data. The analytical data sheets have tab names bracketed by <>. For example: <GW - Non-VOCs>. There are six data sheets in all: three for soil and three for groundwater (GW). Chemical concentrations for soil should be entered in milligrams per kilogram (mg/kg); chemical concentrations for groundwater should be entered in micrograms per liter (µg/l). ND (non-detect) values should be included in the results by entering “ND” or “nd” (without the quote marks) as the result (see below). Preview each tab to become familiar with the contents and data format of each sheet. You'll find that VOCs, Non-VOCs, and Metals/Other Organics are entered on separate pages. Note that results for 2-methyl phenol (o-cresol), carbazole, and carbon disulfide are stored in the soil and groundwater worksheets for *metals*. When entering results for these compounds, please look for them on the metals worksheets. DO NOT move these compounds from the

metals worksheets

The software is designed to evaluate only a certain set of chemicals of concern (COCs). These chemicals are listed horizontally near the top of each sheet. When entering analytical results, do not add or delete any columns or otherwise modify the layout of the data sheets. If you do not have results for a particular chemical, leave those columns (result and reporting limit) blank. After you've finished entering analytical results, press **Ctrl + m** to return to the Tier 1 control panel.

Soil Analytical Results (mg/kg)
Volatile Organic Compounds

Clear Existing Results

				Benzene		N-Butyl benzene	
Sample ID	Sample Date	Analytical Method	Sample Depth (ft bgs)	Result	Reporting Limit	Result	Reporting Limit
B1-01	1/4/2003	EPA 994.4	7	ND	0.05		
B1-02	1/4/2003	EPA 994.4	11	0.47	0.05		
B1-03	1/4/2003	EPA 994.4	17	0.49	0.05		
B2-01	1/5/2003	EPA 994.4	7	0.24	0.05		
B2-02	1/5/2003	EPA 994.4	11	0.39	0.05		
B2-03	1/5/2003	EPA 994.4	17	0.12	0.05		
B3-01	1/6/2003	EPA 994.4	7	0.49	0.05		
B3-02	1/6/2003	EPA 994.4	11	0.38	0.05		
B3-03	1/6/2003	EPA 994.4	17	0.08	0.05		
B4-01	1/7/2003	EPA 994.4	7	ND	0.05		
B4-02	1/7/2003	EPA 994.4	11	0.19	0.05		
B4-03	1/7/2003	EPA 994.4	17	0.57	0.05		
B5-01	1/8/2003	EPA 994.4	7	0.3	0.05		
B5-02	1/8/2003	EPA 994.4	11	0.28	0.05		
B5-03	1/8/2003	EPA 994.4	17	0.06	0.05		

Note: selecting the “Clear Existing Results” button will remove the results on the applicable page. This cannot be undone.

5. Select Step 3 to take you to the Tier 1 COCs page. On this page, select the "Clear Soil COC Values" button to clear any previously entered results. [Note: by design, the groundwater results are automatically included and do not require clearing or importing.] Next, select the "Import Soil COCs" button, which derives and imports Tier 1 COC representative concentrations from the data sheets. Then select a land use button (you'll be reminded to provide a DEUR if you select non-residential; refer to “How 2 Tier 2” for preparing a DEUR). Finally, select the "Perform and View Tier 1 Evaluation" button. **Note that although the Tier 1 Results worksheet is selectable at any time while running ART2, Tier 1 results should only be viewed by selecting the “Perform and View Tier 1 Evaluation” button on the Tier 1 COCs worksheet**.

6. Tier 1 results. If any of the COCs fail the Tier 1 evaluation, a message will pop-up telling you so and giving you tips regarding what to do next (to continue on to Tier 2 or no). If you decide to proceed with Tier 2, select the "Start Tier 2" button near the upper left hand corner of the Tier 1 results or press **Ctrl + t** to continue.

Tier 2 (Ctrl + t)

1. If you're not already there, press **Ctrl + t** to go to the Tier 2 control panel. Briefly look at what tasks you'll be performing for Tier 2. You'll be using the same analytical data entered during the Tier 1 evaluation. You will be performing each of the steps in Section A, Required Steps:

   Create Conceptual Site Model
   Select Receptors
   Create Representative Concentrations
   Modify Site-Specific Parameters
   Justify Parameter Modifications

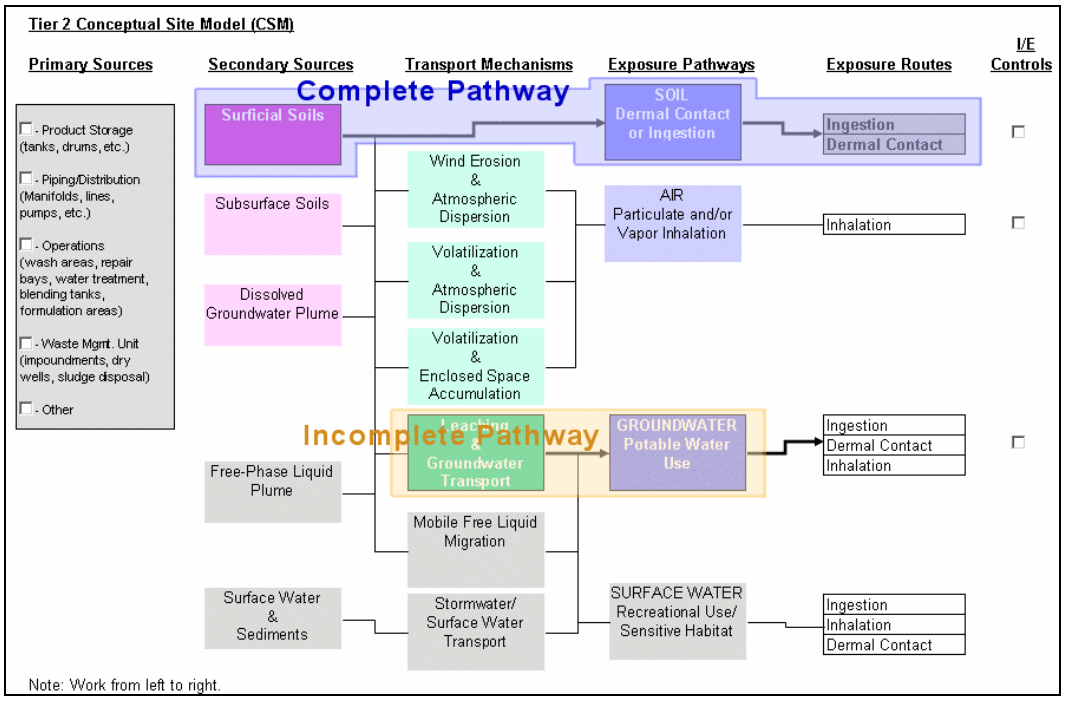
   Additionally, you'll be performing some of the steps in Section B, Exposure-Scenario Dependent Steps, depending on the conceptual site model (CSM) and receptors. The first thing to do here is...

2. Select Step 1, Create Conceptual Site Model, to take you to that page. Here you will see the options for developing the conceptual site model for your site. Work your way from left to right, selecting the applicable primary sources, secondary sources, transport mechanisms, exposure pathways, and exposure routes, based on current use of your site. Once a pathway is complete, it will be shown by a BOLD pathway line from the Secondary Sources column to the Exposure Routes column and the Exposure Routes will also be displayed in BOLD with gray background (see below).

   If you need to make changes to an already completed CSM, select the "Reset CSM" button and start over. Failing to do this may result in undesired effects.

   Certain transport mechanisms, exposure pathways, and exposure routes are linked to other mechanisms, pathways, and routes. This is a direct reflection of the equations in the Release Reporting and Corrective Action Guidance that are used for the calculation of Tier 1 and Tier 2 risk-based concentrations. Selecting one of these linked items will automatically select the other. Please refer to "How 2 Tier 2" for additional information.

   Note that a completed pathway and selection of the receptors for the land use selects the Exposure Routes automatically; you cannot directly select an Exposure Route.



Checking the I/E box precludes the calculations of risk-based concentrations for that pathway, but requires the submission of a DEUR application with the report. [Please refer to the ADEQ document "How 2 Tier 2" for the correct use of the I/E (institutional and engineering) Controls checkbox and the required supporting documentation for I/E controls.]

Once the CSM is completed, press **Ctrl + t** to return to the Tier 2 control panel.

3. Back on the Tier 2 Control Panel, select Step 2, Select Receptors. When finished, press **Ctrl + t** to return to the Tier 2 Control Panel to continue with Step 3 (or you can select the "Create Representative Concentrations" button on the Receptors page).

4. From the Tier 2 Control Panel, select Step 3, Create Representative Concentrations, which will take you to the Representative Concentrations Control Panel. ART2 uses ProUCL, a program created and maintained by the U.S. EPA, to create representative concentrations for the site. ART2 will help you create properly formatted input files for ProUCL, as well as import the ProUCL output files. However, you will still need to run ProUCL yourself.

   The Tier 2 evaluation divides the site analytical data into three groups: surficial soil (soil 15 feet below ground surface or less), subsurface soil (soil greater than 15 feet below ground surface), and groundwater. Using ART2, you will create ProUCL input files for COCs in each of these groups. If you are unsure about

which groups you have data for, go ahead and run ART2 for each group. ART2 will indicate whether or not you have data in that group. (For example, if you're unsure if you have soil samples deeper than 15 feet, when ART2 asks you to select an input data medium, go ahead and select Subsurface Soil when prompted.) For each of the three groups you will need to go through the following two steps:

a) Select 1, Clear Previous Input Values.
b) Select 2, Make Input File. When you select Make Input File, you'll be prompted to Select Input Data Media: surficial soil, subsurface soil, or groundwater. Select a medium and select the Go button. Once ART2 processes the applicable data, it will ask you to save the ProUCL input file. At this point, navigate Excel to the ProUCL program folder and save the file. Use a name that you can later recognize as a particular input file for the selected data set. ART2 helps a little by starting the file name with 'ProUCLInput', but you can name it whatever you wish. For example, you could name your groundwater ProUCL input file ProUCLInputGW.xls.

After the input files have been created, you'll need to run ProUCL by selecting 3, Run ProUCL. Here are the steps required to run ProUCL with ART2. Deviating from these steps could create invalid representative concentrations.

a) In ProUCL, select File > Open and navigate to where you saved the ProUCL input files. Select the medium input file you want to work with (*e.g.*, ProUCLInputGW.xls). You can only open one input file at a time. ProUCL will read in that input file and display it. [NOTE: on some computers, there is a bug in ProUCL that prevents it from displaying the input file properly. To get the input file to display, you may have to select anywhere on the screen where the input file should be displayed or scroll the ProUCL screen. Even if the input file doesn't display properly, ProUCL should still work properly.]
b) From the ProUCL menu select Upper Confidence Levels (UCLs) > Fixed Excel Format. ProUCL may ask you to specify the location of the data in the input files. Use the defaults by selecting OK in this window.
c) ProUCL will now show you a window listing all the COCs that were in the input file. You will need to select each COC, one at a time, to create ProUCL output file(s). After selecting a COC, select Compute UCLs to have ProUCL calculate UCLs for the selected COC. After the UCLs are calculated, ProUCL will display the results. [Again, you may encounter the same ProUCL display bug mentioned above.]
d) Save the UCL output file for this particular COC (the COC name will be shown at the top of the ProUCL program window) by selecting File > Save As, navigating to the ProUCL folder, and saving the file using a file name where you can recognize both the medium (surficial soil, subsurface

soil, or groundwater) and the chemical. We recommend that the medium type be at the first of the file name for ease of picking results later (especially if there are several COCs to be considered). For example, the output file for benzene in groundwater could be named gw_benz.xls.

e) Repeat steps b through d for each COC in the medium input file. When finished, close each of the ProUCL files (File > Close). Repeat step a (then steps b through d) for each medium file (*e.g.*, ProUCLInputGW.xls). When you have finished with all of the COCs for all mediums, close ProUCL and return to ART2.

Back in ART2, select Import Representative Concentrations on the Representative Concentrations Control Panel, where you'll then be prompted to select a medium. ART2 will display a listing of all the available ProUCL output files for all media. Select all those files for the medium selected (*e.g.*, all files beginning with gw_ for groundwater) and select OK. ART2 will then step through each ProUCL output file and check the validity of the output. If there are problems with an output file, you will be prompted to decide what to do.

When ART2 has finished with the output files for the first medium (*e.g.*, surficial soil), you will be automatically moved to the ProUCL Output worksheet. If there are more media files to be processed (*e.g.*, subsurface soil), select the Import Representative Concentrations button near the top of the page. **Note that if you had imported ProUCL output from a different site (e.g., with different chemicals, different land use, different receptors, different CSM, etc.) during a previous run of ART2, those ProUCL results will still be on the ProUCL Output worksheet.** Be sure to select the Clear Previous Results button and re-import the ProUCL output by selecting the Import Representative Concentrations button. You'll be able to re-import any or all media again on the ProUCL Output worksheet. After importing all representative concentrations, press **Ctrl + t** or select the Tier 2 Control Panel button to return to the Tier 2 control panel.

5. Steps 4 and 5 on the Tier 2 Control Panel allow you to modify and justify site-specific parameters. Default ADEQ values are shown in purple under the Default column; these are for your reference only and cannot be changed. Site-Specific Values, shown in green, are initially set to the ADEQ default values. Change any of the site-specific values to match those of your site. Justification must be provided for every parameter that is modified from the default values (Step 4). Please refer to "How 2 Tier 2" for information regarding site-specific values outside of established boundaries.

6. The next steps in the Tier 2 process select the calculations that will be performed to derive applicable site-specific target levels (Section B of the Tier 2 Control Panel). Refer to the CSM and Table 1, below, to determine which process buttons

to select. Looking at the CSM, determine which pathways are complete and identify that pathway on Table 1. In the far right column of Table 1, identify the ART2 process that needs to be completed and select that process back on the Tier 2 Control Panel.

Secondary Source	Transport Mechanisms	Exposure Pathways	Select ART2 Process
Surficial soils	(none)	Dermal contact or ingestion	Surficial soil - direct contact
Surficial soils	Wind erosion and atmospheric dispersion	Particulate and/or vapor inhalation	Surficial soil - indoor inhalation
Surficial soils	Volatilization and atmospheric dispersion	Particulate and/or vapor inhalation	Surficial soil - indoor inhalation
Subsurface soils	Volatilization and enclosed space accumulation	Particulate and/or vapor inhalation	Subsurface soil - indoor inhalation
Subsurface soils	Leaching and groundwater transport	Potable water use	Subsurface soil - leaching to groundwater
Dissolved groundwater plume	Volatilization and enclosed space accumulation	Particulate and/or vapor inhalation	Groundwater - indoor inhalation
Dissolved Groundwater Plume	Leaching and groundwater transport	Potable water use	Groundwater - ingestion

Table 1. Tier 2 SSTL Calculations

a. Selecting any of the inhalation buttons will take you to applicable (surficial, subsurface, or groundwater) Johnson-Ettinger (J-E) model pages. Using site-specific data, modify the J-E data, as necessary. Justification will be required for all values that deviate from the default values.
b. Surficial Soil – Direct Contact and Groundwater – Ingestion are calculated automatically by Excel.
c. If Groundwater – Ingestion is selected, you'll be taken to the GPL Data Control page **(Ctrl + g)**. On this page, change any parameter necessary to better-describe site conditions relative to chemicals leaching to groundwater. At a minimum, you must enter a depth of incorporation and a depth to groundwater. Justification will be required for values that deviate from the defaults.

   When you have finished modifying the input parameters, select the "Run Model" button to create the GPL-derived values. When the model runs, a

DOS window will open and give the results of the GPL calculation for a particular COC. If the GPL run was successful, press the **Enter** key to return you to ART2 again. At this point, ART2 will ask you if the model run was successful, if it was, simply press the **Enter** key again or select "Yes". Continue this confirmation process until all the COCs have been processed. Next, enter valid SPLP values for all COCs that failed Tier 1; please refer to "How 2 Tier 2" for obtaining these values.

7. At this point, the Tier 2 calculations are complete.

   In Section C of the Tier 2 Control Panel, select Create Summary Page to have ART2 sort through the results and develop a summary page of the site-specific target levels (SSTLs). The Summary Page will be at the end of the SSTL pages, just in front of the Risk/Hazard pages, if there are any (refer to "How 2 Tier 2").

   To begin reviewing the SSTLs for the receptors chosen, press **Ctrl + s**. If warranted by the results, Risk/hazard pages will be viewable just to the right of the SSTLs pages.

8. Several additional worksheets are available for providing supporting documentation for each case:

   Cost Comparison Summary
   Corrective Actions
   Exposure Assessments
   Leachability
   Calculation Variations
   References
   Land Use

   Additionally, there are eight generic "Attachment" worksheets for additional supporting documentation not listed above.

   Most of these additional worksheets are cover pages for the supporting documentation. The type and amount of supporting documentation that is required differs from case to case. Please refer to the ADEQ publication "How 2 Tier 2" for details on how to determine and produce what is required for your particular case.

9. To begin creating your Tier 2 report, either select the "Print Manager" button on the Tier 2 Control Panel or press **Ctrl + r**. The Print Manager will automatically select pages that will need to be printed, with the exception that you will need to manually select any supporting documentation worksheets that you need to provide (such as histogram pages from ProUCL, see above). If you want to

preview any of the pages before printing, use the Excel Print Preview feature.

Using ART2 on Multiple Sites

If you wish to use ART2 on multiple sites, save a copy of the application with a different name. A good practice is to download and install the application and immediately make a copy of the application (`ART2.xls`) for your particular site(s), saving the original for backup or for additional sites to be evaluated later.

For example, download and install ART2. Using Windows Explorer, navigate to the ART2 directory. Select `ART2.xls`, press `Ctrl + c` (copy) then `Ctrl + p` (paste), creating a file named `Copy of ART2.xls`. Then rename `Copy of ART2.xls` to match the site you'll be evaluating, for example: `art2 site 29.xls`.

Multiple renamed copies of the application can and should remain in the same directory.

Similarly, when using ProUCL for multiple sites, name your input and output files to differentiate them from the files for other sites (see Tier 2, Step 4, above).

FURTHER ASSISTANCE

To assist in the implementation of ART2, ADEQ is maintaining a telephone assistance line until June 30, 2005. For assistance with the installation and use of ART2, call Jeanene Hanley, Senior Risk Assessor, Rules and Risk Assessment Unit, Arizona Department of Environmental Quality, 1110 West Washington Street, MC-4415B-2, Phoenix, Arizona 85007, **(602) 771-4314**, hanley.jeanene@ev.state.az.us. She will have an ART2 specialist call you.

APPENDIX A – TIPS AND SHORTCUTS

ART2 is a large file and can take a while to save. If you have Excel's AutoRecovery feature turned on, it may appear that ART2 periodically hangs or stalls when the AutoRecovery information is being saved. To avoid this, turn off AutoRecovery (in Excel, `Tools > Options > Save`).

As with any application, we recommend that you save your work frequently during the use of ART2.

While every effort was made to make ART2 user friendly from the perspective of what is visible on the screen, what you see on your PC may differ from what others see due to your screen resolution, etc. Be sure to scroll around each page to make sure you're seeing everything.

ART2 Shortcuts (case sensitive)

Ctrl + m	Tier 1 control panel
Ctrl + t	Tier 2 Control Panel
Ctrl + g	GPL data control
Ctrl + p	Excel print
Ctrl + P	Parameter Input page
Ctrl + j	Justification page
Ctrl + S	SSTL page (first visible one)
Ctrl + r	Report manager (print manager)